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ABSTRACT

This document includes a final report and curriculum guide from a project to develop a Science and Math Applications curriculum that related science and math to everyday life and promoted confidence in adult basic education students in their science and math skills. The report describes how the curriculum used traditional teaching methods to teach basic science and math concepts with reinforcement through hands-on activities. The targeted audience was 20 adult basic education students who expressed a desire to increase their math and science abilities and an initial fear of science and math. Pre- and postassessment data showed that, on the average, student grade levels rose two levels during their time in the program. Students often left the program with a new attitude toward these subject areas. The math component of the curriculum is broken down into nine subject areas: problem solving; decimal skills; fraction skills; percent skills; probability, ratio, and proportion skills; measurement; data analysis; algebra; and geometry. The science component includes nine subject areas: building reading skills; applying science concepts; analyzing science materials; evaluating science materials; plant and animal biology; human biology; earth science; chemistry; and physics. An outline for each subject area correlates skills with assessment, materials, and teaching strategy and techniques. Handouts and an 18-item bibliography are provided. (YLB)

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ED 376 354

Final Report

Science and Math Applications

Lori A. Lauver, Instructor

1993-1994 Program Year

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Adult Education and Job Training Center
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99-4029 - $10,517

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Table of Contents

	Page
Abstract	2
Introduction	3
Statement of Problem	8
Goals and Objectives	10
Procedures	11
Results	12
Evaluation	13
Dissemination	14
Conclusions/Recommendations	15
Appendices:	
Curriculum	17
Handouts	80
Bibliography	86

Abstract

Title: Science and Math Applications

Project Number: 99-4029 **Funding:** $10,517

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Lewistown, PA 17044

Purpose: "Science and Math Applications" was developed to promote confidence in the math and science abilities of ABE students. It helped students extend their knowledge of science and math, as well as correlate these two subject areas to their everyday life by using both textbooks and hands-on activities.

Procedures: The project, "Science and Math Applications," was facilitated by instructors of the Adult Education and Job Training Center. A curriculum was developed by instructor Lori Lauver which utilized somewhat traditional teaching methods to teach basic science and math concepts with reinforcement through hands-on activities. The audience targeted was 20 ABE students who expressed a desire to increase their math and science abilities and who expressed an initial fear of science and math.

Summary of Findings: Evaluation of "Science and Math Applications" was based upon several factors: 1) development and use of "Science and Math Applications" curriculum. The curriculum was developed and utilized throughout the project. 2) participation of 20 Adult Basic Education students in the program. This number was exceeded as 33 ABE students participated. 3) the performance of hands-on activities that promoted concept retention. Pre- and post-assessment data was reviewed and showed that, on the average, student grade levels rose two levels during their time in the program. 4) a final report and bibliography. A final report, including detailed curriculum, outline and bibliography, was produced.

Comments: The value of this project is high, and its use is recommended for use with ABE students that have anxieties pertaining to math and science. Students gained confidence and interest in their science and math abilities and often left the program with a new attitude towards these subject areas.

Products: A final report was disseminated by the Pennsylvania Department of Education, AdvancE, and Tuscarora Intermediate Unit.

Science and Math Applications

Introduction

"Science and Math Applications" was a new project designed to promote confidence in the math and science abilities of ABE students. This program was intended for students who had developed a fear of math and science during their previous educational experience, and who also may feel that there is little or no correlation between what is taught in the classroom and real life experiences. Through "Science and Math Applications," ABE students used both textbooks and hands-on activities to extend their knowledge of math and science, as well as link these two subject areas to everyday life.

There has definitely been a need to demystify the subject areas of math and science within the Adult Basic Education students in our area. In speaking with the students prior to enrollment in this program, most potential students expressed a concern for their abilities in science and (more often) math abilities. Many students, especially those who came into the program after being out of school for a number of years, felt that there had been little correlation between what they were expected to learn and real life applications made in the public schools. It was a goal of this program to attempt to make the connection between math and science concepts and their application.

This project proposed to (1) develop and utilize the "Science and Math Applications" curriculum that relates science and math to everyday life, promotes confidence in ABE students in their science and math skills, and (2) promote math and science programs by serving approximately 20 ABE students over 2 ten-week sessions, 10 students each session, by using the "Science and Math Applications" curriculum. The "Science and Math

Applications" curriculum was developed, implemented, revised, and implemented with the revisions to another group of participants. At first, many students were quite apprehensive when "science" and "math" were mentioned, but throughout the course of the program their confidence levels grew. We served 33 ABE students, many who were working towards earning their GED. Due to this and the open-entry / open-exit policy that our organization has in Juniata County, we were unable to limit this program to two sessions with definitive entry and exit dates. The program became somewhat class-paced; the program progressed at a pace that best served the students involved in it. We felt that this change was necessary in order to ensure that the first objective, to promote student confidence and understanding of their math and science skills, was met.

Throughout the 1993-94 program year, interested participants enrolled in this program. The time frame for project activities follows:

- July, and August '93 - Curriculum development and recruitment.

- September '93 - June '94 - Instruction in science and math applications in groups of approximately 10 students.

Science and Math Applications Class Schedule

Month	Dates		Hours
September '93		8	2.5
	13	15	5
	20	22	5
	27	29	5
October '93	4	6	5
	11	13	5
	18	20	5
	25	27	5
November '93	1	3	5
	8	10	5
	15	17	5
	22	24	5
December '93		1	2.5
	6	8	5
	13	15	5
	20	22	5
January '94	3	5	5
	10	12	5
	17	19	5
	24	26	5
	31	Feb .2	5
February '94	7	9	5
	14	16	5
	21	23	5
	28	Mar.2	5
March '94	7	9	5
	14	16	5
	21	23	5
	28	30	5
April '94	4	6	5
	11	13	5
	18	20	5
	25	27	5

Project Director was Carol Molek. Ms. Molek has over 10 years experience coordinating adult programs for the IU and developing and implementing special projects. Ms. Molek directed the project, supervised the other personnel involved, and reported to and communicated with the Department. The instructor for the project was Lori A. Lauver, Adult Instructor. Ms. Lauver has two years experience as an ABE , and GED instructor. Ms. Lauver has also conducted SPOC classes and Community Service Block Grant sessions on topics such as budgeting, communication skills, and job readiness / retention. Ms. Lauver was responsible for developing the curriculum, selecting materials, conducting student intake interviews, providing instruction and conducting follow-up activities.

The audience that benefitted most from this program was adults who lack confidence in their math and science abilities. "Science and Math Applications" was directed to adults who wished to gain both confidence and knowledge in the subject area of math and science. It was specifically targeted to those students whose basic educational potential is below their potential, especially those who did not hold a high school diploma.

The audience that may benefit from this report are other practitioners in the field exploring ways to better assist their students to overcome math and science inadequacies.

Permanent copies of this report can be obtained from:

Bureau of Adult Basic and Literacy Education
Pennsylvania Department of Education
333 Market Street
Harrisburg, PA 17126-0333

and

AdvancE
Pennsylvania Department of Education
333 Market Street
Harrisburg, PA 17126-0333

and

Western Pennsylvania Adult Literacy Resource Center
5347 William Flynn Highway
Route 8
Gibsonia, PA 15044-9644

"Science and Math Applications" was administered by the Tuscarora Intermediate Unit No. 11. The TIU is a local education agency which provides educational and management services to 9 school districts and 3 area vocational technical schools in Fulton, Huntingdon, Juniata, and Mifflin counties.

The Intermediate Unit sponsors all TIU Adult Education and Job Training Center programs in Lewistown, as well as the centers located in Juniata and Perry counties. Center programs include: 322 Adult Basic Education and General Educational Development programs; Job Training Partnership Act Adult Basic Education, employment and job training programs; single parent / displaced homemaker services. In addition, the I.U. has sponsored forty-three 310/353 special projects.

Statement of Problem

As adult educators we are constantly exploring new methods of correlating the material that we teach with experiences that students can relate to. Throughout our ongoing recruitment efforts we are constantly reminded by potential students that some of their biggest fears came from math and science. The "Science and Math Applications" program allowed us to reach students who wanted to improve their skills in these areas.

Most participants of "Science and Math Applications" came into our classes frustrated with their abilities in math and science. In most cases, these were the subjects that gave students the most trouble in their prior educational experiences and they feared having to confront their feelings of possible failure. "Science and Math Applications" allowed the instructor to draw meaningful parallels between textbook material and common experiences which dispelled some of the students' fears. The basic math and science concepts were taught through somewhat traditional means, and were reinforced by hands-on activities and active class discussions. Once the fears were lessened, general attitudes usually improved, leading to more productive instructional and experimental time. One student recently commented, "I used to really be afraid of math and science and hated coming to class, but now I actually like coming to math and science class. It makes more sense now."

Another problem that many of our students faced was that much of the math and science that they had learned had been forgotten over time or they had simply never had some of the subject matter (i.e., algebra, geometry, chemistry, and physics). "Science and Math Applications" introduced the material that students were expected to learn, gave ample time for practice,

and included hands-on activities which all aided in students understanding concepts and retention of information. In addition, for those who were parents, this program allowed students to experience a portion of the material that their children or grandchildren may learn in school. This further boosted their confidence levels and gave them a better outlook towards the subjects of math and science.

Goals and Objectives

Objectives as stated in the proposal were as follows:

- develop and utilize the "Science and Math Applications" curriculum that relates science and math to everyday life, promotes confidence in ABE students in their science and math skills, and promotes an interest in math and science

- promote math and science programs by serving approximately 20 ABE students over 2 ten-week sessions, 10 students each session, by using the "Science and Math Applications" curriculum.

Procedures

The general design of "Science and Math Applications" involved a two stage plan. Phase One consisted of recruitment and curriculum development. Phase Two involved implementation of the curriculum with revision of content as necessary. Our plan was for twenty (20) participants to be provided with fifty (50) hours of instruction. Classes met two days per week for two and one-half hours each session; one and one-half hours of each session was dedicated to math concepts and applications, and one hour of each session concentrated on science concepts and applications. When instructing students in science, we spent the first one-half hour of each segment on building reading skills, and dedicated the remaining one-half hour to a specific content area and activities associated with it. Our goal was to improve the students' understanding and retention of math and science concepts.

Results

The first objective was successfully met. The "Science and Math Applications" curriculum was developed and implemented to ABE clients in our Juniata County office who needed to improve their math and science skills. The curriculum development was conducted by the instructor. The instructor collected and modified materials from various sources to be used in the curriculum (see bibliography). Software and computers owned by the Adult Education and Job Training Center were utilized.

The training was delivered to 33 students (20 planned). Classes were tentatively scheduled for two sessions; one beginning in September and one in January. Due to the individual needs of students within the classes, the lack of any other adult education facility in the county, and our facility's open-entry / open-exit policy, we did not feel that the students could fully benefit from this program unless it was based on the class' rate of progress. Also, due to the extremely harsh weather that our state received during the winter months, valuable instruction time would have been forfeited if the original schedule would have been followed. Due to the individual goals of our students in this program and their ability levels, when the student achieved his/her goal within the program, they moved on into other programs.

Evaluation

Evaluation of this program has been a continual process. A case information form was utilized in order to obtain information about students' prior school experiences and any areas of perceived difficulty. TABE Locator tests were administered in order to pinpoint the student's entry level to our program with regards to math. Reading levels were determined using the San Diego Quick (vocabulary development) and the Ekwall Reading Inventory. Students' progress was noted as they progressed through the program by the oral and written responses of questions pertaining to math and science concepts, attendance, and GED practice tests, as well as their participation in hands-on activities. Measurement of total completion and success has been based on:

- development and implementation of the "Science and Math Applications" curriculum
- participation of 33 Adult Basic Education students in the "Science and Math Activities" program

In addition, a detailed curriculum outline is attached.

Dissemination

This project will be available for dissemination through:

Bureau of Adult Basic and Literacy Education
Pennsylvania Department of Education
333 Market Street
Harrisburg, PA 17126-0333

and

AdvancE
Pennsylvania Department of Education
333 Market Street
Harrisburg, PA 17126-0333

and

Western Pennsylvania Adult Literacy Resource Center
5347 William Flynn Highway
Route 8
Gibsonia, PA 15044-9644

Specific questions should be directed to:

Carol Molek
Tuscarora Intermediate Unit
Adult Education and Job Training Center
MCIDC Plaza One Belle Avenue
Building 58
Lewistown, PA 17044

Conclusions / Recommendations

Overall, we are pleased with the outcome of "Science and Math Applications." Participants made excellent progress in their confidence and understanding of both science and math concepts. By reviewing TABE scores given throughout the duration of the program, all students made progress with the average progress made being 2.55 grade levels.

Due to the nature of this program, we would not recommend its implementation in an organization that has an open-entry / open-exit policy. It was challenging to direct several groups of students who were at different stages in the program simultaneously. During the course of implementation of the "Science and Math Applications" program, we had to limit the times when new people could be admitted into the program. We found that as long as the class size was small, students could be permitted to enter the program on a six-week cycle (start a new group of people every six weeks). This worked as long as the group sizes were no more than six to eight people and there were two chalkboards or dry erase boards to use for instructional purposes. When class sizes rose above that level, a waiting list was used to begin new students when space permitted.

Most students commented positively on the class schedule; they did not fully appreciate the reasoning behind having sessions two times a week for two and one-half hours per session until they were absent or when sessions were cancelled due to inclement weather. They recognized during these times that their retention of information was not as good and progress was not as rapid as when their attendance was regular .

Curriculum

Table of Contents

Forward to Instructor
Math Concepts and Activities
Science Concepts and Activities

Forward to the Instructor

The "Math and Science Applications" curriculum was designed for use in an ABE / GED classroom. Class size for this program was limited to no more than 10 people per session, which allowed more attention to be given to those students who needed it. Classes were held twice weekly for 2 1/2 hours each day. The philosophy that the "Science and Math Applications" curriculum followed was to teach basic skills and reinforce these skills by relating them to everyday life and providing hands-on activities for further understanding.

"Math and Science Applications" was funded through a 353 Project Development Grant by the Pennsylvania Department of Education.

Breakdown of Skills Necessary for Each Component of Math and Science Curriculum

Breakdown of Math Concepts

Problem Solving
- Understanding the Question
- Finding Necessary Information
- Choosing the Correct Arithmetic Operation
- Choosing the Correct Solution

Decimal Skills
- Place Value of Decimals
- Reading and Writing Decimals
- Comparing Decimals
- Rounding Decimals
- Adding Decimals
- Subtracting Decimals
- Multiplying Decimals
- Dividing Decimals
- Solving Decimal Word Problems

Fraction Skills
- Equivalent Fractions
- Comparing Fractions
- Adding Fractions (Same and Different Denominators)
- Subtracting Decimals (Same and Different Denominators)
- Subtracting Mixed Numbers by Borrowing
- Multiplying Fractions
- Dividing Fractions
- Solving Fraction Word Problems

Percent Skills
- Converting Decimals and Fractions to Percents
- Commonly Used Percents
- The Percent Circle
- Finding Part of a Whole
- Finding What Percent a Part is of a Whole
- Finding the Whole When Given a Part
- Solving Percent Word Problems

Probability, Ratio, and Proportion Skills
- Probability
- Dependent Probability
- Ratio
- Proportion
- Problem Solving with Probability, Ratio, and Proportion

Measurement
- Standard Measurement
- Metric Measurement
- Comparing, Ordering, and Simplifying Measurements
- Arithmetic Operations
- Measurement Word Problems

Data Analysis
- Tables
- Bar, Line, Circle (Pie) Graphs, and Pictographs

Algebra
- Introduction to Algebra- It's nothing new
- Learning the Language of Algebra
- Writing Algebraic Expressions
- Solving Algebraic Equations
- Writing and Solving Multi-Step Equations
- Solving Algebraic Word Problems
- Working With Formulas

Geometry

- Geometric Shapes
- Perimeter and Circumference
- Powers and Roots
- Area
- Volume
- Angles
- Triangles
- Similar Figures
- Congruent Figures
- Pythagorean Theorem

Breakdown of Science Concepts

Buiiding Reading Skills
- Summarizing the Main Idea
- Restating Information
- Identifying Author's Implications

Applying Science Concepts
- Applying Given Ideas in a Different Context
- Applying Remebered Ideas in a Different Context

Analyzing Science Materials
- Facts, Hypotheses, and Opinions
- Assumptions (Unstated)
- Cause and Effect Relationships
- Drawing Conclusions

Evaluating Science Materials
- Judging the Value and Adequacy of Information
- Recogizing Values
- The Scientific Mathod

Plant and Animal Biology
- Characteristics and Growth of Living Things
- Communities of Living Things

Human Biology
- The Human Brain
- Taking Care of Your Body
- Systems of the Human Body

Earth Science
- The Earth in Space
- The Structure of the Earth

Chemistry

- The Structure of Matter
- How Matter Behaves
- The Chemistry of Life

Physics

- Properties of Motion
- Properties of Waves
- Electricity and Magnetism
- Nuclear Physics
- The Energy Outlook for the Future

Subject Area: Problem Solving

SKILL	ASSESSMENT	MATERIALS	TEACHING STRATEGY AND TECHNIQUES
1. Understanding the question.	Student will underline correctly 9 out of 10 questions within word problems.	Pre-GED Mathematics and Problem-Solving Skills (Contemporary) pp. 4-5.	Discuss what a word problem is. Let class know that most of the problems that are on the math test are word problems and you will teach them how to solve word problems. Go over how to identify the question and understand what it wants you to find. Emphasize that if students do not work carefully and fully understand the question, that their answer will probably be wrong. Discuss reading techniques that would help them when searching for the question (read carefully and slowly; look for question marks; most questions / statements are found at the end of a problem).
2. Finding necessary information.	Student will identify the difference between given information and necessary information correctly 6 out of 7 times.	Pre-GED Mathematics and Problem-Solving Skills (Contemporary) pp. 6-7.	Define necessary information and given information. Necessary- only those numbers and labels needed to answer a specific question; given- all information that is given in the problem. Define extra information as any information that you are given in a problem but don't need to solve the problem.

SKILL	ASSESSMENT	MATERIALS	TEACHING STRATEGY AND TECHNIQUES
3. Choosing the correct arithmetic operation.	Students will choose the correct arithmetic operation 20 out of 24 times.	Pre-GED Mathematics and Problem-Solving Skills (Contemporary) pp. 8-13. "Math Key Words" Macintosh computer, "Math Blaster Mystery" (Davidson).	Discuss how students know what arithmetic operation to perform. Explain the idea of **key words** and how to use them. Do several sample problems with the class instructing which operation should be performed. Allow students to work in pairs using the "Math Blaster Mystery" program to sharpen their skills for determining which arithmetic operation should be performed.
4. Selecting the correct solution.	Students will choose the correct solution to basic word problems 13 out of 15 times.	Pre-GED Mathematics and Problem-Solving Skills (Contemporary) pp. 16-25.	Review the steps to solving word problems. Discuss the order of operations (parentheses, multiplication, division, addition, subtraction). Have students put away all paper and pencils; give oral calculations for them to perform without writing anything down. Then, allow students to use pencil and paper to solve problems that are written on the board by using the order of operations. Students should be able to choose the correct arithmetic expression, as well as choose the correct answer. Teach students to question their answers as to their appropriateness; they should ask themselves, "Does this answer make sense?"

Additional Resources for Problem Solving Skills

Cambridge (1982). Cambridge Exercise Book for the Mathematics Test. New York: Cambridge Book Company, pp. 1-9.

Frechette, Ellen C. (1991). Number Power 7: Problem Solving and Test-Taking Strategies. Chicago: Contemporary Books, Inc.

Kaplan, Jerome D. (1988). Strategies for Solving Math Word Problems. New York: Educational Design, Inc., pp. 5-24.

Subject Area: Decimal Skills

SKILL	ASSESSMENT	MATERIALS	TEACHING STRATEGY AND TECHNIQUES
1. Understanding place value of decimals.	Students will verbally answer questions about the place value 6 out of 8 times.	"Decimals and Place Value"	Write 3.564 on the board and ask, "Can anyone read this number?" Introduce place value names. It is sometimes helpful if the students can relate decimals to money; i.e. if you have 54¢, how do you write this and what does it mean?
2. Reading and writing decimals.	Students will correctly read decimal numbers 15 out of 18 times.	Pre-GED Mathematics and Problem-Solving Skills (Contemporary) pp. 35-38.	Discuss with students the proper way to read decimals; read the whole number, say "and" where the decimal is, and read the decimal part of the numer as you would a whole number and say the place value that the last digit occupies.
3. Comparing numbers that have decimals.	Students will arrange a group of numbers containing decimals correctly 15 out of 18 times.	Pre-GED Mathematics and Problem-Solving Skills (Contemporary) pg. 39. "Comparing Decimal Numbers"	Explain to students that in order to compare numbers which contain a decimal, they must have the same number of decimal places. To give each decimal number the same number of decimal places, add zeros to the right of the last digit. Then, compare the numbers.
4. Rounding Decimals	Students will correctly round decimal numbers to the designated place value 22 out of 24 times.	Pre-GED Mathematics and Problem-Solving Skills (Contemporary) pp. 40-41.	Discuss the similarities between rounding whole numbers and rounding decimal numbers. Have students practice underlining the place value that they are rounding to; look at the number to the right and if it's five or more, round up one number; if it's less than five, leave it.

SKILL	ASSESSMENT	MATERIALS	TEACHING STRATEGY AND TECHNIQUES
5. Adding and subtracting decimals.	Students will correctly perform the operations of addition and subtraction in 28 out of 30 problems.	Pre-GED Mathematics and Problem-Solving Skills (Contemporary) pp. 42-47.	Instruct students on the correct way to add and subtract decimal numbers. The numbers must have the same number of decimal places before you may begin. Write the problem horizontally, lining up the decimal points. Then, drop the decimal down and follow the rules for addition and subtraction of whole numbers.
6. Multiplication of decimal numbers.	Students will correctly muliply numbers containing decimals 36 out of 40 times.	Pre-GED Mathematics and Problem-Solving Skills (Contemporary) pp. 48-51.	Discuss rules for multiplying whole numbers. Relate the multiplication of decimal numbers to this by telling students to ignore the decimals at first. Multiply the numbers as you normally would. After this is completed, count the total number of places that you would have to move to reach the decimal point. Count from right to left that number of places and insert the decimal point. Do several examples with the students.
7. Divding a decimal by a whole number.	Students will perform the operation of division correctly as it pertains to decimals 8 out of 10 times.	Pre-GED Mathematics and Problem-Solving Skills (Contemporary) pp. 52-54.	Explain process-- to divide a decimal by a whole number, place the decimal point in the answer directly above the decimal in the problem.
8. Dividing a decimal by a decimal.	Students will complete the process of dividing a decimal by a decimal 12 out of 15 times.	Pre-GED Mathematics and Problem-Solving Skills (Contemporary) pp. 55-57.	Discuss the proper way to perform division when the numbers that are given contain decimals; first make the divisor a whole number by moving the decimal point to the far right side. Then, move the decimal point of the dividend the same number of places, making sure to put the decimal point in the answer directly above the decimal in the problem.

SKILL	ASSESSMENT	MATERIALS	TEACHING STRATEGY AND TECHNIQUES
9. Decimals and problem solving.	Students will apply what they've learned about decimals by accurately completing word problems 48 out of 50 times.	Pre-GED Mathematics and Problem-Solving Skills (Contemporary) pp. 58-63.	Have students verbally review rules for completing operations (+,-,x, +) with numbers containing decimals. Also review the proper steps to take when problem solving. Allow students time to begin this in class.

Additional Materials for Decimal Skills for Use as Needed:

Cambridge (1988). Pre-GED Exercise Book in Math. Englewood Cliffs, New Jersey: Prentice Hall, Inc., pp. 71-85.

Cambridge (1982). Cambridge Exercise Book for the Mathematics Test. New York: Cambridge Book Company, pp. 17-24.

Howett, Jerry (1989). Contemporary's New GED Test 5, Mathematics. Chicago: Contemporary Books, Inc., pp. 50-75.

Subject Area: Fraction Skills

SKILL	ASSESSMENT	MATERIALS	TEACHING STRATEGY AND TECHNIQUES
1. Differentiating between proper and improper fractions as well as mixed numbers.	The student will verbally identify proper and improper fractions correctly 13 out of 15 times.	Pre-GED Mathematics and Problem-Solving Skills (Contemporary) pp. 66-67. Teacher-fabricated or purchased manipulatives that represent fractions.	Discuss what fractions represent using manipultives if necessary. I've found that it's easier for students to understand if there is something tangible that they can look at such as breaking a candy bar into pieces.
2. Understanding equivalent fractions.	The student will use simplification and raising fractions to higher terms to show the correct equivalent fraction 28 out of 30 times.	Pre-GED Mathematics and Problem-Solving Skills (Contemporary) pp. 68-70.	Ask students if they know what the word equivalent means. If they don't know, point out that the root word is equi- which means "equal." Emphasize that the class will be finding fractions that are equal to each other. Use pages 68 and 70 to explain how to change fractions to an equivalent form. Emphasize that whatever you do to the top, you must do to the bottom (you can relate this to having children; whatever you buy for one, you must buy for the other).

SKILL	ASSESSMENT	MATERIALS	TEACHING STRATEGY AND TECHNIQUES
3. Comparing fractions.	The student will arrange fractions in the order specified (ascending or descending) correctly 12 out of 15 times.	Pre-GED Mathematics and Problem-Solving Skills (Contemporary) pp. 71-72.	Write the fractions 3/8 and 5/8 on the board and ask the students to identify the larger fraction. If they respond "5/8" ask them how they knew that this was correct. Explain that when the denominators (bottom #s) are the same, the bigger the numerator (top #s) are, the larger the fraction is. If the denominators are different, the students must select a common denominator that both original denominators can divide into evenly and find the equivalent fractions with that common denominator. This can be explained in terms of having two children who want to know who is getting a larger portion of a candy bar.
4. Adding fractions (same and different denominators).	The student will correctly solve a variety of fraction addition problems 36 out of 40 times.	Pre-GED Mathematics and Problem-Solving Skills (Contemporary) pp. 73-75, 80-90.	Discuss the process of addition of fractions that have the same denominator; add the numerators and keep the same denominator. Explain the process of adding fractions with different denominators; get the fractions into equivalent forms with the same denominator and add as explained above.
5. Subtracting fractions (same and different denominators).	The student will correctly solve a variety of fraction subtraction problems 18 out of 20 times.	Pre-GED Mathematics and Problem-Solving Skills (Contemporary) pp. 76-77.	Discuss the process of subtraction of fractions that have the same denominator; sub tract the numerators and keep the original denominator. Explain the process for subtracting fractions that have unlike denominators; follow the same steps as you did for addition of unlike fractions, but instead of adding the numerators subtract them.

SKILL	ASSESSMENT	MATERIALS	TEACHING STRATEGY AND TECHNIQUES
6. Subtracting mixed numbers by borrowing.	The student will correctly solve a variety of problems involving subtracting mixed numbers by borrowing 38 out of 40 times.	Pre-GED Mathematics and Problem-Solving Skills (Contemporary) pp. 78-91.	Review how to subtract whole numbers by borrowing (i.e. 46-39). Take the students through the steps on pg. 78; Step 1: borrow 1 from the number that you're subtracting from. Step 2: change the borrowed 1 to a fraction that has the same form as the fraction you are subtracting (i.e. if you're subtracting 5/6 the 1 should be 6/6). Step 3: Subtract the fractions and bring down the whole number.
7. Multiplying fractions.	The student will correctly solve multiplication of fraction problems 45 out of 50 times.	Pre-GED Mathematics and Problem-Solving Skills (Contemporary) pp. 92-95.	Explain to students the process of "beginning" multiplication of fractions; multiply the numerators to get new numerator and multiply denominators to get new denominator. Once they understand this concept, explain the process of using cancelling to reduce fractions to lowest terms; follow the direction of the multiplication symbol in the problem. Is there a number that will go into both of these numbers? If so, do the division and check in the other direction. For example, the problem 3/5 X 15/21: Is there a number that will go into both 3 and 21 (7)? Divide both numbers by 3. Is there a number that will go into both 5 and 15 evenly (5)? Divide both numbers by 5. Rewrite fractions after each division and perform multiplication.

SKILL	ASSESSMENT	MATERIALS	TEACHING STRATEGY AND TECHNIQUES
8. Dividing fractions.	The student will correctly solve division of fraction problems 28 out of 30 times.	Pre-GED Mathematics and Problem-Solving Skills (Contemporary) pp. 96- 99.	Discuss what division means: you're trying to find out how many times one number will go into another number. Explain "rules" for division of fractions; look at your problem, take your second fraction and do the "flippty-dip" (a name that I made up for inverting that students seem to remember better than "invert"). Change the division sign to a multiplication sign and multiply.
9. Solving fraction word problems.	The student will correctly solve a variety of word problems containing fractions 38 out of 40 times.	Pre-GED Mathematics and Problem-Solving Skills (Contemporary) pp. 100-103. Cambridge Exercise Book for the Mathematics Test (Cambridge) pp. 9-17.	Review the "Math Key Words" handout from the Problem Solving section of this curriculum. Review how to solve word problems using problem solving steps in the first section of this curriculum. Allow students time to work independently on problems and pull class together to discuss difficult problems.

Additional Materials for Fraction Skills for Use as Needed:

Cambridge (1988). Pre-GED Exercise Book in Math. Englewood Cliffs, New Jersey: Prentice Hall, Inc., pp. 44-62.

Cambridge (1982). Cambridge Exercise Book for the Mathematics Test. New York: Cambridge Book Company, pp. 9-17.

Howett, Jerry (1989). Contemporary's New GED Test 5, Mathematics. Chicago: Contemporary Books, Inc., pp. 76-115.

Subject Area: Percent Skills

SKILL	ASSESSMENT	MATERIALS	TEACHING STRATEGY AND TECHNIQUES
1. Converting decimals to fractions and fractions to decimals.	The student will convert decimals to fractions and fractions to percents 18 out of 20 times.	Pre-GED Mathematics and Problem Solving Skills (Contemporary) pp. 104-111.	Teach students how to change fractions into decimals; the easiest way that I've found to teach this is to have the student set up the division in the denominator part of the fraction. Show student where to put decimal (after the numerator), add zeroes as necessary and divide. Teach students how to change decimals into fractions; write the numbers after the decimal as the numerator. Next, write the place value of the last digit in the decimal as the denominator. Reduce if necessary.
2. Converting decimals and fractions to percents.	The student will correctly convert decimals and fractions to percents 30 out of 35 times.	Pre-GED Mathematics and Problem Solving Skills (Contemporary) pp. 114-121.	Explain the process for changing a decimal to a percent: move the decimal point two places to the right. Explain the process for changing a fraction to a percent: change the fraction to a decimal and follow the previous rule.
3. Commonly used percents.	The student will correctly complete a chart of commonly used percents, decimals, and fractions with 95% accuracy.	Pre-GED Mathematics and Problem Solving Skills (Contemporary) pg. 122. "Percent Pieces" (if need remediation).	Explain to the students that during the GED they will be expected to know how to convert certain decimals, fractions, and percents from one form to another. Stress that it is crucial that they are familiar with this chart. Allow time to work independently in class and address any problems.

SKILL	ASSESSMENT	MATERIALS	TEACHING STRATEGY AND TECHNIQUES
4. The Percent Circle.	The student will demonstrate how to use the percent circle to solve problems by physically demonstrating the correct technique 13 out of 15 times.	Pre-GED Mathematics and Problem Solving Skills (Contemporary) pp. 124-125.	Discuss the importance of being able to solve percent problems quickly during the test. The percent circle is a tool that students can use in order to help them remember how to solve for the part, whole, or percent without memorizing the individual formulas. Discuss the correct way to use the percent circle and stress that the students should memorize this.
5. Finding Part of a Whole.	The student will correctly answer questions authored by other students (based on problems that have been used in class) 15 out of 20 times.	Pre-GED Mathematics and Problem Solving Skills (Contemporary) pp. 126-131. Student authored questions.	Review how to use percent circle to find the part (place finger over "P" and do what the circle shows you to-- "% X W"). Review several problems in the book and discuss how the problems were written. Allow students class time to begin writing word problems. Collect problems at the next class, copy, and distribute for students to complete.
6. Finding What Percent a Part is of a Whole.	The student will correctly solve problems where finding the percent is required 28 out of 30 times.	Pre-GED Mathematics and Problem Solving Skills (Contemporary) pp. 132-135. "Percent Increase and Decrease Practice"	Review how to use the percent circle to find what percent a part is of a whole (place finger over "%" and do what the circle shows you to-- "P ÷ W". Complete problems in the book on the board, giving students a chance to instruct other students about how they should solve the problems. Discuss where this knowledge may come into use (discounts, sales, price increases, raises, etc.). Assign "Percent Increase and Decrease Practice" if more practice is necessary.

SKILL	ASSESSMENT	MATERIALS	TEACHING STRATEGY AND TECHNIQUES
7. Finding the Whole When Given a Part.	The student will correctly answer questions dealing with finding the part when a part is given 22 out of 25 times.	Pre-GED Mathematics and Problem Solving Skills (Contemporary) pp. 136-138.	Review how to use the percent circle to find the whole when given a part (place finger over "W" and do what the circle shows you to-- "P ÷ %"). Remember, percents must be changed to either decimals or fractions before students can proceed with the problem.
8. Solving Percent Word Problems.	The student will correctly solve percent problems that are not grouped according to what students are expected to find (part, percent, or whole) 35 out of 40 times.	Pre-GED Mathematics and Problem Solving Skills (Contemporary) pp. 139-140. Pre-GED Exercise Book in Mathematics (Cambridge) pp.93, 94, 96, 97, 99, 100.	Review the steps that are necessary to solve any type of word problems (see Problem Solving Subject Area). Have students suggest hints on how to decide which problems ask you to find the part and write the suggestions on the board. Repeat this for finding the percent, and finding the whole. Allow them time to begin work on word problems in class; address any questions.

Additional Materials for Percent Skills for Use as Needed:

Cambridge (1988). Pre-GED Exercise Book in Math. Englewood Cliffs, New Jersey: Prentice Hall, Inc., pp. 92-105.

Cambridge (1982). Cambridge Exercise Book for the Mathematics Test. New York: Cambridge Book Company, pp. 24-34.

Howett, Jerry (1989). Contemporary's New GED Test 5, Mathematics. Chicago: Contemporary Books, Inc., pp. 128-157.

Subject Area: Probability, Ratio, and Proportion Skills

SKILL	ASSESSMENT	MATERIALS	TEACHING STRATEGY AND TECHNIQUES
1. Probability (definition and finding the probability of an outcome occurring).	The student will correctly find the probabilty of an outcome occuring 13 out of 15 times.	Pre-GED Mathematics and Problem Solving Skills (Contemporary) pp. 172-175. Pennies, spinners, deck of cards, cans of soup (with labels).	Discuss what probability is (the chance of something happening). Describe how to find probability and how to write probability as both a fraction (the number of times that it is possible that the outcome can occur is the numerator and the total number of possible outcomes is the denominator) and as a percent (convert the fraction to a percent; review if necessary). Allow students to practice solving probability problems in the book, then allow time to experiment with spinners (probability of landing on a certain color or number), deck of cards (probability of choosing certain cards; can be specific or general), and cans of soup (chance of choosing certain brand and/or flavor).
2. Dependent Probability.	The student will correctly identify the probability of an outcome occurring in problems where the answer is dependent on other factors 18 out of 20 times.	Pre-GED Mathematics and Problem Solving Skills (Contemporary) pp. 176-177. Pennies, spinners, deck of cards, cans of soup (with labels).	Explain to students the concept of dependent probability (where the probability of one thing depends on the probability of another). Demonstrate an example using four (4) cans of soup [i.e. pea, chicken noodle, vegetable (2)]; if you choose a can of pea soup on your first try, what is the probability of choosing a can of vegetable soup on the second try? (Answer: 2/3). Allow students to practice this concept by pairing up and using the materials, posing questions to each other.

SKILL	ASSESSMENT	MATERIALS	TEACHING STRATEGY AND TECHNIQUES
3. Ratio.	The student will write the correct ratio for a given problem 18 out of 20 times.	Contemporary's New GED Test 5, Mathematics (Contemporary). pp.119-120.	Explain to students that there are many ways to compare numbers and using ratios is one method. Instruct students on the proper way to express ratios and allow them time to practice in pairs. Remind students that because a ratio can be expressed as a fraction, ratios should always be reduced. Also remind students that there are always two numbers in a ratio. After students have practiced as pairs answer any questions and assign student to find ways in which ratios are used using different resources (i.e. newspapers, television, business reports, sports, etc.) and ask them to report their findings during the next class.
4. Proportion.	The student will corectly set up and solve proportion problems 10 out of 12 times.	Contemporary's New GED Test 5, Mathematics pp. 121-122.	Discuss what a proportion is (it's made up of two equal ratios). Write two examples of proportions on the board (9:12 = 3:4 and 9/12 = 3/4). Give students the opportunity to discover that the second proportion looks very similar to equivalent fractions. Discuss with students that missing terms within proportions can sometimes be solved for as you would solve equivalent fractions. Other times, you must solve for the term by cross-multiplication. In order to cross-multiply, take the denominator of the first fraction and multiply it by the numerator of the second fraction. Then, set the result equal to the numerator of the first fraction times the denominator of the second fraction. **Do not confuse this with the multiplication of fractions!!**

SKILL	ASSESSMENT	MATERIALS	TEACHING STRATEGY AND TECHNIQUES
5. Problem Solving with Probability, Ratio, and Proportion.	The student will correctly solve a mixture of word problems containing ratios, probabilities, or proportions 18 out of 20 times.	Contemporary's New GED Test 5, Mathematics pp. 124-127. Student authored questions	Discuss and review how to solve probability, ratio, and proportion problems. Allow students to "discover" which words indicate each of the different types of problems; instructor should write student "hints for success" on the board, discussing each hint as it appears. Allow students to work in pairs or alone (their choice) to solve ten problems. Assign homework to be completed individually.

Subject Area: Measurement Skills

SKILL	ASSESSMENT	MATERIALS	TEACHING STRATEGY AND TECHNIQUES
1. Standard Measurement.	The student will correctly convert units of standard measurement 15 out of 18 times.	Contemporary's New GED Test 5, Mathematics pp. 158-161. Yardsticks, rulers, measuring cups, milk cartons (quart and gallon).	Discuss the history of the Standard Units of Measurement. Review (or introduce) the standard measurements and stress that it will be expected that everyone knows the units and their equivalencies; students should memorize these if they don't know them. Encourage students to write these in their notebooks. Instruct students on the proper way to convert measurements by using proportions or by multiplying and dividing (see book for more information). Allow students to prove that the forms are, in fact, equivalent by using rulers, yardsticks and liquid measuring devices.
2. Metric Measurement.	The student will correctly convert metric measurements 18 out of 20 times.	Contemporary's New GED Test 5, Mathematics pp. 162-164. Rulers (metric and standard) Milk containers (pint, quart, and gallon), Soda bottles (liter and 2-liter)	Describe the metric system (based on tens, hundreds, thousands, etc.)to students and the fact that it is used in most countries outside the United States. Tie in prefixes of the metric units to common words (milli- as in millipede, centi- as in century, deci- as in decade). Inform students of the two ways in which metric measurements can be converted, by moving the decimal point and by using proportion. Allow students time to explore the differences in length and volume between standard and metric measurement.

SKILL	ASSESSMENT	MATERIALS	TEACHING STRATEGY AND TECHNIQUES
3. Comparing and ordering measurements.	The student will correctly compare and put measurements into order 8 out of 10 times.	Contemporary's New GED Test 5, Mathematics pp. 165-166. Rulers, yardsticks	Explain to students that it is often necessary to compare two or more measurements; give the example of cooking. In order to know which mixing bowl to use, you must know if all of your ingredients will fit. Demonstrate the process for comparing and ordering measurements; give time to work in pairs on developing own problems.
4. Simplifying Measurements.	The student will correctly simplify standard measurements 10 out of 12 times.	Contemporary's New GED Test 5, Mathematics pp. 166-167.	Discuss that when you add and multiply standard measurements that simplification of the answer may be necessary. Explain what simplification means (if your answer is 22 inches, you must change it to feet and inches because 22 inches is larger than one foot). In order to simplify the solution, divide the number of units in your answer by the number of these units that are in the next larger unit of measurement; write the remainder in terms of the smaller unit. For 22 inches, divide 22 by 12 (the number of inches in a foot); write the remainder (10) in terms of inches.
5. Arithmetic Operations with Standard Measurements.	The student will correctly perform arithmetic operations on standard measurement problems 13 out of 16 times.	Contemporary's New GED Test 5, Mathematics pp. 168-171.	Discuss the material presented on pages 168 and 169 with the class. While the material is being discussed, students should be writing the example problems down. Address any questions immediately; it's very easy for students to get confused in this section.

SKILL	ASSESSMENT	MATERIALS	TEACHING STRATEGY AND TECHNIQUES
6. Measurement Word Problems.	The student will accurately solve word problems involving measurement 14 out of 16 times.	Contemporary's New GED Test 5, Mathematics pp. 174-178.	Review problem solving techniques. Emphasize that measurement is used every day in one way or another. Allow students to work individually; if they have questions, require them to ask two classmates before asking the instructor. This will give students an opportunity to help each other and offer different perspectives on class material.

Additional Materials for Measurement Skills for Use as Needed:

VanCleave, Janice (1991). Math for Every Kid. New York: John Wiley & Sons, Inc., pp. 39-46.

Subject Area: Data Analysis

SKILL	ASSESSMENT	MATERIALS	TEACHING STRATEGY AND TECHNIQUES
1. Working with Tables.	The student will correctly solve problems involving the use of tables 8 out of 10 times.	Pre-GED Mathematics and Problem-Solving Skills (Contemporary) pp. 162-163. Contemporary's New GED Test 5, Mathematics (Contemporary) pp. 197-199.	Introduce the students to tables; pose the question: "Where are tables used?" Discuss how tables are used in everyday life and the importance of being able to use information from them. Demonstrate problem solving techniques to help alleviate difficulties in understanding the information being presented. Stress the importance of reading the graph (including the title) before reading the problems that are given.
2. Using Pictographs.	The student will correctly use pictographs to answer questions 8 out of 10 times.	Pre-GED Mathematics and Problem-Solving Skills (Contemporary) pp. 168-169. Contemporary's New GED Test 5, Mathematics (Contemporary) pp. 180-184.	Introduce students to pictographs. Discuss the purpose of the **key**. Explain to students how to find the total value of a line of symbols (multiply value of one symbol times the number of symbols). Discuss the types of questions that students may encounter when using pictographs (finding a specific value or comparing two or more values).

SKILL	ASSESSMENT	MATERIALS	TEACHING STRATEGY AND TECHNIQUES
3. Using Circle Graphs.	The student will correctly use circle graphs to answer questions 8 out of 10 times.	Pre-GED Mathematics and Problem-Solving Skills (Contemporary) pp. 164-165. Contemporary's New GED Test 5, Mathematics (Contemporary) pp. 185-188.	Introduce students to circle (pie) graphs. Ask students to identify any differences and similarities between circle graphs and other types of graphs. Discuss that information can be presented in two ways: each segment being a percent value (segments add up to 100%) or where each segment is given a number of cents as a value (segments add up to $1.00). Have students work in pairs to complete sample problems of each type. Have students develop questions about given circle graphs.
4. Using Bar Graphs.	The student will correctly answer questions involving the use of bar graphs 8 out of 10 times.	Pre-GED Mathematics and Problem-Solving Skills (Contemporary) pp. 166-167. Contemporary's New GED Test 5, Mathematics (Contemporary) pp. 188-193.	Show students a sample bar graph and ask if anyone knows what type of graph it is (in most cases at least one student will know). If students know that the example was a bar graph, ask them to explain how to use the graph (go over this with entire class if the student explanation is insufficient). Discuss the types of information that are often expressed in bar graphs.
5. Using Line Graphs.	The student will correctly use line graphs to answer questions 8 out of 10 times.	Pre-GED Mathematics and Problem-Solving Skills (Contemporary) pp. 170-171. Contemporary's New GED Test 5, Mathematics (Contemporary) pp. 193-196.	Discuss line graphs and their uses. Stress to students that precise graph reading is necessary, especially with line graph. Have student suggestions to read line graphs more effectively discussed during the progression of questions.

Additional Materials for Data Analysis Skills for Use as Needed:

VanCleave, Janice (1991). Math for Every Kid. New York: John Wiley & Sons, Inc., pp. 129-165.

Subject Area: Algebra

SKILL	ASSESSMENT	MATERIALS	TEACHING STRATEGY AND TECHNIQUES
1. Introduction to Algebra- It's nothing new.	The student will verbally answer questions dealing with beginning algebra 4 out of 5 times.	Board, markers.	Ask students who have had algebra before to raise their hands. More often than not, there may only be one or two students who have done algebra before. Ask students to raise their hands is they are unsure about what algebra is. Explain that in algebra you are expected to find a value that you don't know. Give the example of 100 - ___ = 67. Ask if anyone can fill in the blank. Explain that this, in essence, is algebra; you're searching for a value that you are not given. Explain that the algebra in this chapter will help them solve more problems than they would normally be able to solve.
2. Learning the Language of Algebra.	The student will use the language of algebra to correctly describe concepts 4 out of 5 times.	Contemporary's New GED Test 5, Mathematics (Contemporary) page 202.	Define the following words for students: variables, expressions, equations, and formulas. Stress the importance of being able to understand how to "speak the language of algebra."
3. Writing Algebraic Expressions.	The student will correctly write algebraic expressions 18 out of 20 times.	Contemporary's New GED Test 5, Mathematics (Contemporary) pp. 202-204. Working With Numbers, Algebra (Steck-Vaughn) page 5.	Discuss the proper way to write algebraic expressions. Give students examples of writing expressions using the four basic arithmetic expressions (addition, subtraction, multiplication, and division). Ask students how they would write the expression if there were a number substituted for the missing value; if needed, demonstrate the substitution. Review key words that provide clues as to what operation is to be performed.

SKILL	ASSESSMENT	MATERIALS	TEACHING STRATEGY AND TECHNIQUES
4. Solving Algebraic Equations.	The student will correctly solve algebraic equations 28 out of 30 times.	Contemporary's New GED Test 5, Mathematics (Contemporary) pp. 205-208. Working With Numbers, Algebra (Steck-Vaughn) pp. 10-11, 48-52.	Review the difference between expressions and equations. The method that I've found most effective in teaching students how to solve equations is to tell them that in algebra they get the opportunity to be rebels. This means that when variables (letters) are on opposite sides, you do the opposite of the operation shown. When variables appear on the same side of the equation, you combine like terms (explain what this means). Do several examples on the board where students must tell what operation needs to be performed.
5. Solving Algebraic Word Problems.	The student will correctly solve algebraic word problems 14 out of 16 times.	Contemporary's New GED Test 5, Mathematics (Contemporary) pp. 208-210.	Review problem solving skills; solving algebraic word problems is no different than solving any other type of word problem. Stress the importance of reading carefully in order to arrange the information in the correct order.
6. Writing and Solving Multi-Step Equations.	The student will correctly write and solve muti-step algebra equations 15 out of 18 times.	Contemporary's New GED Test 5, Mathematics (Contemporary) pp. 210-216.	Review with students on the board how they solved basic equations. Writing and solving longer equations is no different, it just takes more steps. Instruct students on the proper way to solve muti-step equations; take care of combining like terms and any addition or subtraction first. Then, complete any multiplication or division to finish the problem.

SKILL	ASSESSMENT	MATERIALS	TEACHING STRATEGY AND TECHNIQUES
7. Working With Formulas.	The student will correctly solve problems using the distance formula, total cost formula, and interest formula 8 out of 10 times.	Contemporary's New GED Test 5, Mathematics (Contemporary) pp. 219-221.	Cover the interest, distance, and total cost formulas. Stress that students will not need to memorize these. Show students how to substitute in values that are given for variables in the equation. Allow class time for practice.

Additional Materials for Algebra Skills for Use as Needed:

Hensley, Andrewdelle. Solving Algebraic Word Problems. Cincinnati: South-Western Publishing Company.

Lassiter, Karen. Math Matters for Adults, Measurement, Geometry, and Algebra. Austin: Steck-Vaughn Company, pp. 107-164.

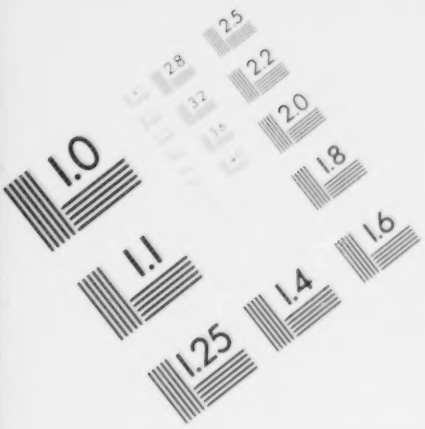
Mitchell, Robert. Contemporary's Number Power 3, Algebra. Chicago: Contemporary Books, Inc.

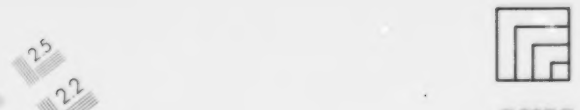
Shea, James. Working with Numbers, Algebra. Austin: Steck-Vaughn Company.

Subject Area: Geometry

SKILL	ASSESSMENT	MATERIALS	TEACHING STRATEGY AND TECHNIQUES
1. Recognizing geometric shapes.	The student will correctly identify geometric shapes 15 out of 20 times.	Contemporary's New GED Test 5, Mathematics (Contemporary) pp. 224-227.	Define geometry for students. Give examples of practical applications of geometry (buying fencing materials, measuring for carpet area, determining volume of a liquid- will it all fit, etc.). The easiest way that I've found that students understand the geometric shapes is if you provide them with concrete examples of them. The examples may be as simple as cardboard or paper cutouts of the shapes or as elaborate as plastic shapes. Ask students to identify objects in the classroom that have certain geometric shapes.
2. Finding Perimeter and Circumference.	The student will correctly find the perimeter or circumference of objects 8 out of 10 times.	Books, cans (various sizes), rulers, yardsticks. Contemporary's New GED Test 5, Mathematics (Contemporary) pp. 227-230.	Introduce students to the formulas for finding perimeter and circumference. Remind them that the formulas will be given on the GED test, but they need to know how to apply the formulas. After discussing the formulas and answering any questions about them, ask students to find the perimeter or circumference of common items (books, cans, tables, etc.). Once students understand how the formulas work, allow them to solve problems in class.

SKILL	ASSESSMENT	MATERIALS	TEACHING STRATEGY AND TECHNIQUES
3. Working with Powers and Roots.	The student will correctly solve for the indicated power or square root 18 out of 20 times.	Contemporary's New GED Test 5, Mathematics (Contemporary) pp. 234-238.	Explain to students that before you can teach them how to find the area of something, they must understand powers and square roots. Introduce students to the concept of powers first (you can use this to help students understand roots). In order to raise a number to a power, write the base number (the large number) however many times the exponent (the smaller number) tells you to. For example, 2^5 would be expressed as 2X2X2X2X2 or 32. Inform students of special cases when it comes to powers (pp. 234-235). Have students try several examples, then have students make their own chart of the perfect squares from 1 to 15, and every multiple of 5 up to 100. Do they notice any patterns? To find square roots, ask yourself what number times itself will give me the number that I'm to take the square root of. Make an educated guess (use your chart in the beginning if you need to, but don't rely on it for very long).
4. Finding Area.	The student will correctly find the area of given shapes 23 out of 25 times.	Contemporary's New GED Test 5, Mathematics (Contemporary) pp. 238-244. Rulers, yardsticks, cardboard cutouts of different shapes and sizes.	Introduce the area formulas. Remind students when there is a letter "bumped up" against another letter (or a number) with no sign that multiplication is the operation that should be performed. After students become familiar with the area formulas, ask them to find the area of the room, their book, and cardboard cutouts of shapes. When students are comfortable finding areas, allow time in class to begin work in the textbook.





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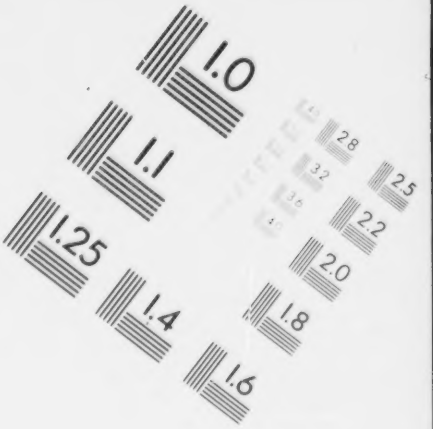

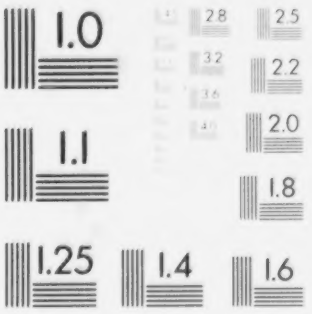

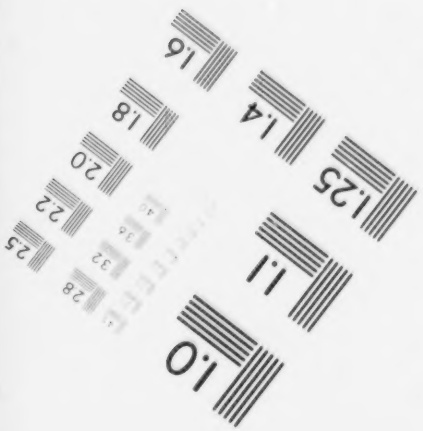

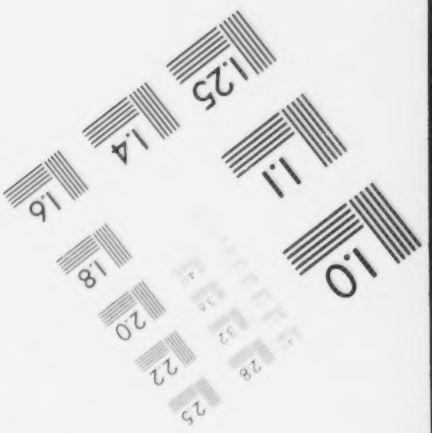

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SKILL	ASSESSMENT	MATERIALS	TEACHING STRATEGY AND TECHNIQUES
5. Finding Volume.	The student will correctly find the area of given shapes 23 out of 25 times.	Contemporary's New GED Test 5, Mathematics (Contemporary) pp. 238-244. Rulers, yardsticks, containers of various shapes and sizes.	Introduce the volume formulas. Ask students to review the area formulas- what is the difference between the formulas for area and volume (one more dimension- height)? After students become familiar with the volume formulas, ask them to find the volume of water that certain containers could hold (have circular, rectangular, and cube-shaped containers). Without being given the formula for the volume of a triangular solid, can the students deduce what it would be (V = 1/2 bhd; V=volume, b=base, h=height, d=depth). When students are comfortable finding areas, allow time in class to begin work in the textbook.
6. Working with Angles.	The student will correctly identify types of angles and angle relationships 38 out of 40 times.	Contemporary's New GED Test 5, Mathematics (Contemporary) pp. 251-256.	Define the types of angles for the students. I found that using everyday examples of each type of angle is useful to students. Acute angles are "a cute little angle"; right angles can be thought of as corners of a room or four-way intersections; obtuse angles are "bigger" angles; straight angles look like their name describes- straight; reflex angles can be described by holding an arm straight out at your side and bending your elbow until your fingers point towards the floor, the angle that is made from the top of your bicep to your wrist on the far side of your body is a reflex angle. Complementary angles are angles whose measurements add up to 90°; supplementary angles are angles whose measurements add up to 180°; vertical angles are across from each other when two straight lines intersect.

SKILL	ASSESSMENT	MATERIALS	TEACHING STRATEGY AND TECHNIQUES
7. Working with Triangles.	The student will correctly label triangles 13 out of 15 times.	Contemporary's New GED Test 5, Mathematics (Contemporary) pp. 257-260.	Orally review what students had learned prior to this point about triangles. Tell students that this is going to expand on what they already know about triangles. Teach students how triangles are named and how to identify different types of triangles (equilateral, isosceles, scalene, and right). Ask students to find the relationship between the number of equal sides and the number of equal angles in the different types of triangles (the number of equal sides is equal to the number of equal angles).
8. Similar Figures.	The student will correctly label similar figures 10 out of 12 times.	Contemporary's New GED Test 5, Mathematics (Contemporary) pp. 260-264. Paper, scissors, rulers.	Discuss with students the definition of "similar"- being close to the same thing, but not exactly the same. Teach students how to determine if figures are similar. The corresponding sides of similar shapes are written as a proportion. If the shapes are similar, the ratios will be the same. Students should follow the same rule when determining the similarity of triangles, with one addition; if two angles of the triangle are equal to two angles of another triangle, the two triangles are similar. After the students are comfortable with similar figures, allow them time to construct several figures and ask other students to determine if the figures are similar or not.

SKILL	ASSESSMENT	MATERIALS	TEACHING STRATEGY AND TECHNIQUES
9. Congruent Figures.	The student will correctly label congruent figures 8 out of 10 times.	Contemporary's New GED Test 5, Mathematics (Contemporary) pp. 264-267. Paper, scissors, rulers, protractors.	Define "congruent"- figures are exactly the same (size and shape). Explain the three conditions that make triangles congruent: "ASA", "SAS", "SSS." Allow students to prove these conditions by constructing their own congruent figures. Permit students to use class time to practice with text problems.
10. The Pythagorean Theorem.	The student will correctly solve problems involving the Pythagorean theorem 9 out of 11 times.	Contemporary's New GED Test 5, Mathematics (Contemporary) pp. 267-272.	Provide students with the Pythagorean theorem formula. Explain what each of the letters stands for. Review how to determine how to square numbers and how to take the square root of numbers. Allow students to work in pairs to determine answers to problems involving the Pythagorean theorem.

Additional Materials for Geometry Skills for Use as Needed:

Cambridge (1982). Cambridge Exercise Book for the Mathematics Test. New York: Cambridge Book Company, pp. 67-74.

Campopiano, John, et.al. (1987). Math + Science, A Soluiton. Fresno, CA: Aims Education Foundation, pp. 65-67

Lassiter, Karen. Math Matters for Adults, Measurement, Geometry, and Algebra. Austin: Steck-Vaughn Company, pp. 71-106.

Mitchell, Robert. Contemporary's Number Power 4, Geometry. Chicago: Contemporary Books, Inc.

VanCleave, Janice (1991). Math for Every Kid. New York: John Wiley & Sons, Inc., pp. 47-98, 167-189.

Subject Area: Building Reading Skills

SKILL	ASSESSMENT	MATERIALS	TEACHING STRATEGY AND TECHNIQUES
1. Summarizing the Main Idea.	The student will correctly summarize the main idea of a passage 8 out of 10 times.	GED, Preparation for the high school equivalency examination, Science, new GED test 3. (Contemporary) pp. 14-20.	Define "main idea" (what the author was writing about). Stress problem solving techniques such as looking for a topic sentence or conclusion that may make it easier for students to find the main idea. Remind students that a main idea is a sentence that everything in the reading passage was about; you could think of it as a "title sentence." When finding the main idea of a graphic, students must make sure that they notice every part of the graphic. Look at titles, drawings, and graphs (if given). Note that finding the main idea is similar to summarizing the passage in one sentence.
2. Restating Information.	The student will correctly restate information that he/she is given 7 out of 9 times.	GED, Preparation for the high school equivalency examination, Science, new GED test 3. (Contemporary) pp. 21-26.	Ask students what it means to restate something (say it in your own words). Discuss how, often times, science passages are written using technical terms that may be difficult to understand. Explain that restating information is a way to put information into words that are easier for people to understand (students call this "putting into just plain English"). When restating information found in graphics, students will be expected to use words to explain what information is given in the graphic. When dealing with diagrams, it is always important to read all captions and labels. Review examples in text and allow students the opportunity to work on problems during class.

SKILL	ASSESSMENT	MATERIALS	TEACHING STRATEGY AND TECHNIQUES
3. Identifying Author's Implications.	The student will correctly identify the author's implications in a passage 8 out of 10 times.	GED, Preparation for the high school equivalency examination, Science, new GED test 3. (Contemporary) pp. 26-30. Math + Science, A Solution (AIMS Education Foundation), pp. 32-36.	Ask students what it means to imply something (to suggest something without directly stating it). Explain that when they are asked to infer other information they are to make an "educated guess" from what the author has directly stated. When identifying implications in a graphic, you will be doing the same thing; making an educated guess at something that is not directly stated. Identifying implications is particularly useful when dealing with line graphs. Teach line graph terminology and show how to properly derive information from a line graph. Allow students to experiment with constructing line graphs and reading data from them (use AIMS materials).
4. Applying Given Ideas in a Different Context.	The student will correctly apply given ideas in a different context 9 out of 10 times.	GED, Preparation for the high school equivalency examination, Science, new GED test 3. (Contemporary) pp. 31-36.	Discuss the importance of being able to apply information that students have already learned to new situations (draw parallels between work and classwork). Explain that students will not always see the information presented in the same format and that they must be somewhat flexible and be able to apply it to different situations. Stress to the students that the information will be presented to them in a reading passage, but they must be able to answer questions about that information that are presented in a slightly different manner.

SKILL	ASSESSMENT	MATERIALS	TEACHING STRATEGY AND TECHNIQUES
5. Applying Remembered Ideas in a Different Context.	The student will correctly apply knowledge that s/he has from experience 4 out of 5 times.	GED, Preparation for the high school equivalency examination, Science, new GED test 3. (Contemporary) pp. 37-38.	Explain to students that occasionally they will be asked a question about science that they are expected to know. The test-taking technique for applying prior knowledge in a new context is to choose the most reasonable answer. Stress that this is not a major portion of the GED exam, but they should be aware of it.
6. Distinguishing Between Facts, Hypotheses, and Opinions.	The student will correctly distinguish between fact, hypotheses, and opinions 14 out of 16 times .	GED, Preparation for the high school equivalency examination, Science, new GED test 3. (Contemporary) pp. 42-50. Local newspapers.	Define fact (something backed by evidence that all scientists agree on), hypothesis (a reasonable explanation of a fact, but not all scientists agree), and an opinion (a person's own belief; how you feel it should be). Allow students to practice classifying statements as facts, hypotheses, or opinions. Conduct a class discussion on why it may be beneficial to know the difference between facts, hypotheses, and opinions. Look at samples of local news stories in a local newspaper; are they facts, hypotheses, or opinions?
7. Recognizing Unstated Assumptions.	The student will correctly recognize unstated assumptions 9 out of 10 times.	GED, Preparation for the high school equivalency examination, Science, new GED test 3. (Contemporary) pp. 50-55.	Discuss the definition of "assumptions" with students (author may assume that you know certain information; s/he may want you to believe certain things; s/he may not have thought of a certain viewpoint). Explain that assumptions are made every day (i.e. When a driver has a red light, you assume that s/he will stop). Go over an example or two using selections from the textbook to ensure full understanding.

SKILL	ASSESSMENT	MATERIALS	TEACHING STRATEGY AND TECHNIQUES
8. Cause and Effect Relationships.	The student will correctly identify cause and effect relationships 10 out of 12 times.	GED, Preparation for the high school equivalency examination, Science, new GED test 3. (Contemporary) pp. 56-61.	Define "cause" (the condition that led to the event's occurrence) and "effect" (the event that occurred). Discuss everyday causes and effects [i.e. I forgot to get gas (cause) and I ran out of gas (effect).]. Allow students to discover that once an effect has occurred, it may become the cause of another effect. Demonstrate and discuss how cause and effect relationships may be represented in diagrams and stress the importance of carefully reading the directions and the labeled parts of the diagram.
9. Drawing Conclusions from Given Details.	The student will correctly draw conclusions from given information 14 out of 16 times.	GED, Preparation for the high school equivalency examination, Science, new GED test 3. (Contemporary) pp. 62-67.	In order to draw conclusions, students must be able to reason logically. A conclusion can only be drawn from the information that is presented. Explain this to students and distinguish the difference between drawing a conclusion and a hypothesis. Demonstrate for students how to use this information to draw conclusions from charts and tables. Allow students time to practice drawing conclusions from graphics in class.

SKILL	ASSESSMENT	MATERIALS	TEACHING STRATEGY AND TECHNIQUES
10. Judging the Value and Adequacy of Information.	The student will correctly judge the value and the adequacy of given information 13 out of 15 times.	GED, Preparation for the high school equivalency examination, Science, new GED test 3. (Contemporary) pp. 68-79.	Judging whether information is valuable and/or adequate is an important skill for students to possess. Discuss relevant and irrelevant information as it pertains to science as well as everyday life. When judging the adequacy of information, students will be expected to determine whether or not enough information is presented in order to draw a conclusion. Use passages and graphics as examples to demonstrate the difference between adequate and inadequate information.
11. Recognizing Values.	The student will correctly identify values in graphics and in reading passages 8 out of 10 times.	GED, Preparation for the high school equivalency examination, (Contemporary) pp. 80-86. National newspapers.	Discuss "values" (a personal belief on how someone should live his/her life) and their importance on decisions made in everyday life. Conduct a class discussion on where we get our values (parents, friends, media, etc.) and how those values effect our lives. Discuss the fact that science often conflicts with people's values and the effects that may arise from this conflict. Allow students to work in pairs to find newspaper articles pertaining to a controversial topic of science where there is conflict of values. Ask students to discuss, but remind them that nobody has values that are "right" or "wrong"; everyone is entitled to their own opinions, and students are allowed to politely disagree (no personal attacks on another person's value system).

SKILL	ASSESSMENT	MATERIALS	TEACHING STRATEGY AND TECHNIQUES
12. The Scientific Method.	The student will correctly use the scientific method to answer questions pertaining to scientific experiments 8 out of 10 times.	GED, Preparation for he high school equivalency examination, (Contemporary) pp. 86-91.	Discuss the need for the scientific method. Outline the scientific method on the board (identify problem, collect information, form a hypothesis, test hypothesis, draw conclusions). Discuss each step and use an example to illustrate each step. Ask each student to think of an instance where they could have used the scientific method to solve a problems. Could it have made finding a solution to the problem easier?

Science Content Area: Plant, Animal, and Human Biology

SKILL	ASSESSMENT	MATERIALS	TEACHING STRATEGY AND TECHNIQUES
1. Understanding What "Biology" Is.	The student will correctly answer questions pertaining to the definition of biology 4 out of 5 times.	GED, Preparation for the high school equivalency examination, Science, new GED test 3. (Contemporary) pp. 92-97.	Define "biology" (the study of living things). Conduct a class discussion on what characteristics of living things; list these on the board. Discuss characteristics of non-living things. Define basic biology terms (cell, stimulus, and response).
2. Recognizing Characteristics of Flowering Plants.	The student will correctly identify characteristics of flowering plants 9 out of 10 times.	GED, Preparation for the high school equivalency examination, Science, new GED test 3. (Contemporary) pp. 98-100. Flowering plants (lillies work well) tweezers magnifying glasses, pins, pens, paper, knife.	Discuss the characteristics of flowering plants. Separate students into pairs; allow students to look at the diagrams on pages 98-99 and label the parts of the flowering plant (pins with paper "flags" work best). Circulate around room to answer questions. Have students cut off one of the stamens and rub lightly across a piece of black paper (look for traces of pollen). If possible, allow students to cut the ovary crosswise and count the ovules. Look for traces of seeds in ovules.
3. Recognizing Animal Characteristics.	The student will correctly identify animal characteristics 7 out of 8 times.	GED, Preparation for the high school equivalency examination, Science, new GED test 3. (Contemporary) pp. 102-105.	Discuss animal adaptation and defense mechanisms. Also, ask students about survival of the fittest-- where do they see this in everyday life?

SKILL	ASSESSMENT	MATERIALS	TEACHING STRATEGY AND TECHNIQUES
4. Distinguishing Plant Cells from Animal Cells.	The student will correctly recognize similarities and differences between plant and animal cells 8 out of 10 times.	GED, Preparation for the high school equivalency examination, Science, new GED test 3. (Contemporary) pp. 106-110.	Before class, construct posters of plant and animal cells (draw lines out from each structure for labeling). In class, discuss the cell structure of each, as well as the function of each part of the cells. Hold a class discussion on similarities and differences between the cells, and allow students to hypothesize reasons for the differences.
5. Understanding Genetics.	The student will correctly answer questions about genetics 11 out of 13 times.	GED, Preparation for the high school equivalency examination, Science, new GED test 3. (Contemporary) pp. 111-115, 147-151.	Define necessary key words associated with genetics (chromosome, trait, genes, dominant and recessive). Discuss cell division and organism reproduction. Draw pictures to demonstrate the combination of sperm and egg cells to form a fertilized egg cell. Use examples of eye color and plant tallness to demonstrate how information is passed from one generation to the next.

SKILL	ASSESSMENT	MATERIALS	TEACHING STRATEGY AND TECHNIQUES
6. Realizing the Interdepen -dence of Living Things-- Ecosystems.	The student will correctly answer questions dealing ecosystems 5 out of 6 times.	GED, Preparation for the high school equivalency examination, Science, new GED test 3. (Contemporary) pp. 115-118. String, index cards with animal names.	Discuss the interdependence of living organisms. Have students discuss what certain animals need to live; types of food, water, shelter, etc. Distribute cards with names of animals, plants, insects, trees, and one card with "water" written on it. Make a "Web of Life" with string to show the interdependence of organisms in an ecosystem. Give a small tug on one section of string; if you feel your string being tugged on the left, tug your string on the right. To demonstrate what happens when one piece of the web is broken, state that all bugs were exterminated (person who has "bugs" card drops his strings). Anyone who was connected to "bugs" will drop their line as they feel it slack. After "Web of Life," discuss findings and why all lifeforms are necessary in order to make the ecosystem work.
7. Understanding Darwin's Theory of Evolution.	The student will correctly answer questions about Darwin's Theory of Evolution 13 out of 25 times.	GED, Preparation for the high school equivalency examination, Science, new GED test 3. (Contemporary) pp. 118-125.	Present Darwin's Theory of Evolution as just that; it's a **theory**, not everyone agrees on it. Discuss Darwin's theory and the scientific bases for it. Define favorable traits, genetic variation and natural selection. Discuss what happens if there is a limited gene pool and risks associated with it.

SKILL	ASSESSMENT	MATERIALS	TEACHING STRATEGY AND TECHNIQUES
8. Understanding How the Human Brain Functions.	The student will correctly identify brain functions 5 out of 6 times.	GED, Preparation for the high school equivalency examination, Science, new GED test 3. (Contemporary) pp. 126-129. Model of Human Brain.	Discuss students prior knowledge of how the human brain functions (students may have their own hypotheses on how the brain works). Read the selection on pages 126 and 127 and discuss the information. Show the model of the human brain to the class and discuss the function of each component of the brain.
9. Understanding the Systems of the Human Body.	The student will correctly answer questions about the skeletal, nervous, digestive, and respiratory systems 18 out of 20 times.	GED, Preparation for the high school equivalency examination, Science, new GED test 3. (Contemporary) pp. 137-146. 700 Science Experiments for Everyone (Unesco) pp. 87, 206. Heavy cardboard, brass fastners, rubber bands, large bottle, cork, Y-tube, brown paper, string, balloons, scissors.	Read through selections in Contemporary's GED book. Discuss what was read and thoroughly cover the graphics and diagrams that are associated with the four major systems within the body (skeletal, nervous, digestive, and respiratory). Using Unesco's experiments, have students create models of the following: the bones and muscles, how the lungs work.

Science Content Area: Earth and Space Science

SKILL	ASSESSMENT	MATERIALS	TEACHING STRATEGY AND TECHNIQUES
1. Distinguishing the Components of Earth Science.	The student will correctly match the type of scientist with the "job description" of that scientist 8 out of 9 times.	GED, Preparation for the high school equivalency examination, Science, new GED test 3. (Contemporary) pp. 152-155.	Discuss the following types of scientists who make up the field of earth science: geologist, astronomer, oceanographer, meteorologist, and paleontologist. Ask students to write a "Help Wanted" advertisement for a particular scientist.
2. Understanding Earth's Place in Space.	The student will correctly use diagrams and written information to answer questions about the planets relative positions 10 out of 12 times.	GED, Preparation for the high school equivalency examination, Science, new GED test 3. (Contemporary) pp. 155-158. Out of This World (AIMS Education Foundation) pp. 1-2, 12-20. Clay or Playdough™, rulers, metersticks.	Ask students if they can recall the names of all nine planets. Have students write the names of the planets in order. Ask students if they think that they have a good idea of what our solar system looks like. Present material from Contemporary and AIMS and conduct the "Space it Out" activity. After activity, discuss student reactions.
3. Differentiating Between Rotation and Revolution.	The student will correctly differentiate between rotation and revolution 8 out of 10 times.	GED, Preparation for the high school equivalency examination, Science, new GED test 3. (Contemporary) pp. 159-161.	Define rotation and revolution for the students. Use students in order to demonstrate the difference between rotation and revolution (rotation- a student turns himself around in a circle with their toes as the axis; revolution- a student goes around another student who is fixed [the sun]). Have students demonstrate what the Earth does in a year (rotates on its axis and revolves around the sun).

SKILL	ASSESSMENT	MATERIALS	TEACHING STRATEGY AND TECHNIQUES
4. Understanding the Earth's Structure.	The student will correctly name the components of the Earth's structure and correctly use a topographical map 8 out of 10 times.	GED, Preparation for the high school equivalency examination, Science, new GED test 3. (Contemporary) pp. 162-167. Several topographical maps of the local area (different dates will show new features), available from County Planning Office.	Discuss the structure of the Earth (internal and surface features) having students name components if they can. Present the theory of plate tectonics/continental drift. Hold a class discussion on natural phenomena that support this theory. Introduce students to topographical maps (topo maps). Without instruction, allow students to view the maps and note characteristics of the maps. Spend time discussing the use of the legend (key). Ask groups of students to compare and contrast maps that were published of the same quadrangle during different years.
5. Understanding the Earth's Atmostpheric Structure.	The student will correctly answer questions pertaining to the Earth's atmosphere and weather 13 out of 15 times.	GED, Preparation for the high school equivalency examination, Science, new GED test 3. (Contemporary) pp. 168-175. Weather map.	Discuss the structure of the Earth's atmosphere and the characteristics of each atmospheric layer. Discuss typical weather forecasts that are seen on local television stations- what components are in each forecasts? Show a sample of a weather map and allow students to discuss the features shown on the map, paying special attention to the legend.

SKILL	ASSESSMENT	MATERIALS	TEACHING STRATEGY AND TECHNIQUES
6. Differentiating Between Weathering and Erosion.	The student will correctly label situations that are forms of either weathering or erosion 9 out of 10 times.	GED, Preparation for the high school equivalency examination, Science, new GED test 3. (Contemporary) pp. 176-179. Guest speaker on erosion.	Define "weathering" (breaking up of rock that may be either chemical or physical) and "erosion" (rock movement caused by wind, water, or gravity). Discuss the different types of both weathering and erosion. Hold a class discussion on examples of weathering and erosion that students are familiar with (any local rock formations, river beds, cracking of asphalt roads, etc.). If possible, schedule a guest speaker from your local conservation district to discuss measures to taken control erosion.
7. Understanding the Earth's History.	The student will correctly answer questions pertaining to fossils and rock layers 7 out of 8 times.	GED, Preparation for the high school equivalency examination, Science, new GED test 3. (Contemporary) pp. 180-183. Rock samples (sandstone, granite, coal, limestone).	Discuss the students' prior knowledge of the Earth's history (fossils, soil/rock layering, appearance of man, etc.). Present a graphic representation of when lifeforms of a certain type (sea and land animals, plants, humans). Present the graphic and the type of information that can be obtained from it. Discuss rock layers and what each type of layer means. If available, show actual samples of different types of rock and have students identify the rock types.

Science Content Area: Chemistry

SKILL	ASSESSMENT	MATERIALS	TEACHING STRATEGY AND TECHNIQUES
1. Understanding the History of Chemistry.	The student will correctly answer questions about the history of chemistry 8 out of 10 times.	Chemistry for Every Kid (VanCleave) pp. xvii-xix. GED, Preparation for the high school equivalency examination, Science, new GED test 3. (Contemporary) pp. 184-186. Macintosh computer, CD-ROM, The New Grolier Multimedia Encyclopedia™.	Ask students what their prior knowledge of chemistry is. Remind students that they will get a basic background in chemistry from this part of the science class, but they will not get as much information as a high school student who was taking chemistry may. Discuss the history of chemistry based on the introduction to VanCleave's books and Contemporary's GED text. If a Macintosh computer is accessible (with a CD-ROM), The New Grolier Multimedia Encyclopedia™, version 6.0.2, has a fantastic section on the Foundations of Science. See additional materials listing for more information.
2. Understanding the Atomic Theory.	The student will correctly label the parts of an atom and list their properties 5 out of 6 times.	GED, Preparation for the high school equivalency examination, Science, new GED test 3. (Contemporary) pp. 186-189.	Discuss the atomic theory and its implications. Draw examples of the structure of several different atoms on the board so students become accustomed to seeing atoms represented in the Bohr model fashion. Give students a drawing of an atom and instruct them to fill in the names of each part of the atom and their properties (i.e. proton-positive charge; found in nucleus).

SKILL	ASSESSMENT	MATERIALS	TEACHING STRATEGY AND TECHNIQUES
3. Using the Periodic Table.	The student will correctly use the periodic table to answer questions about elements 10 out of 12 times.	GED, Preparation for the high school equivalency examination, Science, new GED test 3. (Contemporary) pp. 190-193. Wall chart of Periodic Table.	Introduce students to the periodic table and review skills for using charts and tables with them. Explain that the periodic table is just another chart that tells us information about something, in this case, elements. Ask students to look at the periodic table and locate the "legend" (on every periodic table there is an example how the information is presented. Show students how to use this information to answer questions and provide them with any other information that may be necessary to answer questions about elements that is not directly given in the chart (define mass number, atomic number, period, group).
4. Understanding Molecules and Bonding.	The student will correctly answer questions pertaining to molecule formation and bonding 14 out of 16 times.	GED, Preparation for the high school equivalency examination, Science, new GED test 3. (Contemporary) pp. 194-199.	Define "molecule" and discuss chemical formulas (the written representation of molecule formation). Have students verbally answer questions about components of the formulas (how many atoms of ____ are represented, how many molecules of _____ are represented); question students about how they figured the answers out. Discuss bonding and its role in molecule formation. Differentiate between covalent (atoms share electrons) and ionic bonding (an electron is "stolen" from one atom so that the other can be "happy" or stable).

SKILL	ASSESSMENT	MATERIALS	TEACHING STRATEGY AND TECHNIQUES
5. Exploring the Phases of Matter.	The student will correctly identify the stages of matter and their properties 9 out of 10 times.	GED, Preparation for the high school equivalency examination, Science, new GED test 3. (Contemporary) pp. 200-205.	Discuss the phases of matter and phase changes with students. Ask students to give examples of how water changes from one phase to another and what conditions must be placed on the water to convert it to a new phase. Discuss chemical reactions and the Law of Conservation of Matter.
6. Understanding Organic Chemistry.	The student will correctly answer questions pertaining to organic chemistry 9 out 11 times.	GED, Preparation for the high school equivalency examination, Science, new GED test 3. (Contemporary) pp. 210-214.	Define "organic chemistry" and introduce students to terminology. Give examples of organic chemicals in everyday life and hold a class discussion on our dependence on organic materials and what would happen if these materials were no longer available.
7. Increasing Awareness in the Importance of Recycling Efforts.	The student will demonstrate increased awareness in the importance of recycling by actively participating in the learning center's recycling program.	Plastic trash containers, labels, pens.	Discuss what students do with things that are no longer useful (containers, used paper, cans, etc.). Inquire if the students are aware of recycling efforts that are taking place. Discuss the importance of recycling and what happens to the garbage that gets hauled away from their residence; it gets put into landfills. If possible, invite a guest speaker to speak about landfills (your local Solid Waste Authority should be able to provide this service and perhaps additional literature).

Science Content Area: Physics

SKILL	ASSESSMENT	MATERIALS	TEACHING STRATEGY AND TECHNIQUES
1. Exploring the Properties of Motion.	The student will correctly identify Newton's laws of motion and the Law of Conservation of Energy 8 out of 10 times.	GED, Preparation for the high school equivalency examination, Science, new GED test 3. (Contemporary) pp. 221-227. 700 Science Experiments for Everyone (Unesco) pp. 128-130; listed materials.	Present Newton's Laws of Motion (the Law of Inertia, the Law of Acceleration, and the Law of Interaction) providing examples for each law out of everyday life (stopping a car quickly, throwing a ball, and pushing against someone's hands held in front of them). Discuss the Law of Conservation of Energy (even though energy is changed from one form to another, no energy is lost). Define potential and kinetic energy and give the example presented in Contemporary's book. Unesco's books provides experiments that demonstrate these concepts that make Newton's laws more understandable.
2. Understanding the Properties of Waves.	The student will correctly identify properties of water, sound, and light waves 13 out of 15 times.	GED, Preparation for the high school equivalency examination, Science, new GED test 3. (Contemporary) pp. 234-241. 700 Science Experiments for Everyone (Unesco) pp. 191-203; listed materials.	Define the following: wavelength, frequency, diffraction, reflection, refraction, vacuum, prism. Allow students to experiment with the different types of waves (water, sound and light). Discuss student observations and relate any observations to the properties of all types of waves.

SKILL	ASSESSMENT	MATERIALS	TEACHING STRATEGY AND TECHNIQUES
3. Understanding Electricity and Magnetism.	The student will correctly answer questions about electricity and magnetism 22 out of 25 times.	GED, Preparation for the high school equivalency examination, Science, new GED test 3. (Contemporary) pp. 242-249. 700 Science Experiments for Everyone (Unesco) pp. 191-203; listed materials. A variety of magnets.	Discuss students' prior knowledge of electricity. Define the following: electric current, circuit, conductor, insulator, superconductivity. Discuss differences between AC (alternating current- electrons flow in one direction, then in the opposite direction), and DC (direct current- electrons flow in one direction only) and provide examples of each. Discuss what a magnet is and allow students to experiment with magnets to discover the properties that a magnet has. Show examples of each type of magnet. Allow students to explore the room with magnets to determine which materials are magnetic and which are not (do not allow them to test televisions or computers; this may cause damage to the screens).
4. Understanding Basic Nuclear Physics.	The student will correctly answer questions about basic nuclear physics 9 out of 11 times.	GED, Preparation for the high school equivalency examination, Science, new GED test 3. (Contemporary) pp. 250-254.	Review parts of an atom and define necessary vocabulary (Alpha and Beta particles, Gamma rays, half-life, fission, fusion, chain reaction). Discuss radioactive decay and relate this to hazardous waste disposal. Stress that radioactive materials decay, but they never completely disappear; there is always a trace leftover. Discuss fission, fusion, and chain reactions and briefly explain how a nuclear reactor works.

SKILL	ASSESSMENT	MATERIALS	TEACHING STRATEGY AND TECHNIQUES
5. Realizing that there are Alternate Energy Sources.	The student will correctly identify alternate energy sources 8 out of 10 times.	GED, Preparation for the high school equivalency examination, Science, new GED test 3. (Contemporary) pp. 255-257.	Discuss with the class that fossil fuels may someday run out and energy alternatives are being explored. Hold a class discussion on how they can help conserve energy and on alternative energy sources (wind, water, and geothermal).

Handouts

Math Key Words

Use this sheet to recognize key words that suggest the following operations.

Addition
sum
combined
more
increase
total
and
plus
add
both
altogether
in all
additional

Subtraction
difference
farther than
greater than
how many more
decrease
left
remaining
reduced
less than
more than
dropped
lost

Multiplication
times
total
of
twice
per
by
double
triple

Division
average
divided evenly
split
cut into equal pieces
shared
out of
half
ratio

Decimals and Place Value Names

In order to understand decimals, you must know the place value of numbers within a decimal number. Use the following chart to help.

hundreds	tens	ones	"And"	tenths	hundredths	thousandths	ten-thousandths	hundred thousandths	millionths
___	___	___	.	___	___	___	___	___	___

Comparing Decimal Numbers

In order to compare numbers that contain decimals, you must follow the following rules:

1. Each number must have the same number of decimal places to the right of the decimal. If you need to accomplish this, add zeros to the right of the last digit until the numbers have the same number of decimal places.

2. Compare the numbers by looking at each place value (start at the far left). When you reach a number that is greater than the number that occupies the same place value in the other number, that decimal number is the larger one.

Percent Increase and Decrease Practice

1. You walk into a store and see that your favorite brand of jeans has been marked 20% off their regular price. If the jeans originally cost $24.99, what will their sale price be?

2. You took your car to the mechanic and found out that it needed a new radiator. You told the mechanic to order a new one and install it. To your surprise, there was a 25% labor charge for all jobs that take more than an hour to complete (yours took three hours). If the radiator cost $150, how much would the entire repair bill be (no tax included)?

3. Ten years ago, Tom built a small house in the country and paid $35,000 for it. Now, the area is being built up and houses are selling for 250% more than they were ten years ago. How much would Tom's house sell for now?

4. Martha bought a "New Creations" basket for $30.99. If there is 6% sales tax, and a 8% shipping and handling fee, how much did Martha pay for the basket?

5. If inflation during the past year was 3.5%, how much would a sofa that cost $499 last year cost this year?

6. After her cost of living raise of 3%, Athenia made a weekly salary of $150. How much did she make before the raise?

Answers to Percent Increase and Decrease Practice

1. $24.99
   X .20
   4.9980 (round to 5.00)

   $24.99
   - 5.00
   $19.99

2. $150
   X .25
   750
   +3000
   $37.50

   $150
   + 37.50
   $ 187.50

3. $35,000
   X 2.50
   00000
   175000
   +700000
   $ 87,500

   $ 35,000
   + 87,500
   $122,500

4. $30.99
   X .06
   $1.8594 (round to $1.86)

   $1.86
   +2.47
   $4.33 (tax and shipping)

   $30.99
   X .08
   $2.4792 (round to $2.48)

   $30.99
   + 4.33
   $35.32 (total cost)

5. $499
   x .035
   2495
   +14970
   17.465 (round to $17.47)

   $499.00
   + 17.47
   $516.47

6. $150
   x .03
   4.50

   $150.00
   - 4.50
   $ 145.50

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